Valeology: International Journal of Medical Anthropology and Bioethics
(ISSN 2995-4924) VOLUME 02 ISSUE 07, 2024

Thyroid Hormone Disruption in Pregnancy and Postpartum Complications: A cross-sectional study

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Abstract:

Background: Thyroid hormone disruption as betimes leads to various complications both during pregnancy and in the postpartum period. Concerning maternal health, fetal development, and pregnancy outcomes, thyroid dysfunction can be adverse both in hyperthyroidism or hypothyroidism cases.
Objective: This study aimed to determine the analysis of clinical findings of patients with thyroid hormone disruption during pregnancy and postpartum complications.
Patients and methods: We conducted a cross-sectional study of women with thyroid hormone disruption, which include 77 cases which the participant's data was collected from different hospitals in Iraq during a period ranged from 14 July 2022 to 26 October 2023, where these variables include

each of maternal age, parity, gestational age at the time of pregnancy termination, weight of newborns and quality of life rating.

Results: The current findings found the most women with thyroid hormone disorder was in 40 - 45 years which, include 34 cases, BMI divided into ≤18.5 with 4 cases, 18.6-24.9 with 50 cases, 25-29.9 with 20 cases, and ≥30 with 3 cases, gestational age 38 - 41, weeks had 43 cases, the cesarean section included 25 cases and vaginal delivery included 52 cases, types of pregnancy included singleton which have 68 cases, and twin had 9 cases, TSH was 4.02 ± 0.13, mU/L, Triiodothyronine was 172.02 ± 24.67, ng/dL, Thyroxine was 10.86 ± 3.56, mcg/dL, Thyroid peroxidase was 9.2 ± 0.8 IU/mL, Thyroglobulin was 113.84 ± 6.92 IU/mL, abortion had 3 cases, neonatal deaths was 4 cases, PPH had 2 cases, LSCS had 10 cases, low birth weight had 34 cases.

Conclusions: Hormone production in the thyroid rises during pregnancy, which pregnancy is a time when many women suffer aberrant thyroid function, with a significant risk of hyperthyroidism or hypothyroidism, both of which might lead to poor pregnancy outcomes as well as postnatal complications.

Keywords: *Thyroid hormone disruption; Pregnancy and Postpartum Complications; Quality of life for maternal and fetus.*

Introduction

Thyroid disorders occupy the second place, after diabetes mellitus, as the most common endocrine disorder during pregnancy, makes this disease one of the most interesting and best known among those that can put the normal evolution of a pregnancy at risk [1,2]. However, we are still in unknown sections in the global understanding of the problem, such as the relationships of maternal thyroid hormones with the fetus and the way in which the product develops its metabolic system from the iodine of the maternal diet. [3]

The influence that this fact has on neuronal development and, finally, the behavior of antithyroid antibodies during pregnancy, especially in the puerperium. All these aspects, and more, related to the diagnostic and therapeutic problems posed by pregnancy, make the field of thyroid disease one of the most exciting in the context of human endocrinology. [4,5]

The prevalence of thyroid disorders in women is high, and there is a marked preponderance that is related to greater susceptibility to autoimmune disorders [6]. Thyroid disorders are characterized by an insidious onset of onset and low specificity of their manifestations. Therefore, it is recommended to suspect thyroid disease in case of postpartum depression, menstrual disorders, amenorrhea-galactorrhea syndrome, premature or delayed puberty, unexplained infertility, or recurrent miscarriage [7]. Another observation is that at decisive stages when there are hormonal changes, such as puberty, pregnancy, the puerperium, and menopause, there are physiological modifications of thyroid function, and thyroid disorders also occur. [8]

For the synthesis of thyroid hormones, a sufficient amount of iodine in the diet is necessary, which is absorbed in the small intestine and quickly reaches the thyroid under the effect of thyrotropin [9]. Inside the gland, the iodide is immediately oxidized to become elemental iodine and then proceeds to

bind to thyroxine [10]. The monoiodothyroxine and diiodothyroxine molecules combine to form thyroxine (T4) and triiodothyronine (T3), which are stored inside the thyroglobulin molecule inside the thyroid follicle [11]. About 70% of the circulating thyroid hormones are transported bound to thyroxine-transporting globulin, and the remaining 30% is bound to prealbumin and albumin; T4 has a higher affinity for thyroxine-transporting globulin, and there, T3 can be mobilized more easily [12]. Estrogens have the ability to increase the synthesis of thyrotropin-releasing hormone receptors in the pituitary thyrotropin and, in this way, can increase the secretion of thyrotropin, as occurs during pregnancy and in estrogen therapy. [13]

The homeostasis of thyroid hormones is substantially modified in pregnancy due to two fundamental factors: the first is the increase in the glomerular filtration rate that determines pregnancy; as a consequence, there is an increase in renal iodine clearance, with the consequent decrease in circulating inorganic iodine [14]. The second factor is the considerable increase (up to almost double its values) of the thyroxine-transporting globulin due to the increase in hepatic synthesis induced by estrogens, with the consequent decrease of the available free hormone, so to maintain the availability of thyroid hormones peripherally, they must increase their total values in plasma; however, the amount of free hormone is kept within normal limits [15]. The basal metabolism of the pregnant woman increases considerably due to the increase in vascularization suffered by the uteroplacental area; the volume of the thyroid gland also increases, but it does so in a very variable way. [16]

Regarding autoimmune thyroid diseases during pregnancy, they are profoundly affected by the immunological modifications caused by pregnancy [17]. In the case of hyperthyroidism (Graves' disease), the condition eases as pregnancy progresses due to the immunosuppressive effect of gestation; the incidence of abnormal fetal thyroid function in Graves' disease is 2 to 12%. [18]

Patients and methods

According to the cross-sectional study data, 77 women with thyroid hormone disorder were included; their ages ranged between 20-45 years. We collected demographic and clinical data for patients from different hospitals in Iraq for a period ranging from July 14, 2022, to October 26, 2023. This demographic data included age, body mass index, comorbidities, smoking status, level of education and employment, and the patient's monthly income. This study included data for patients who had thyroid hormone disorders, who had comorbidities, and women whose ages ranged between 20-45 years, while patient data excluded patients who had undergone previous surgeries or were exposed to serious diseases, for example, such as cancer.

In addition, this study recorded data and clinical examinations of patients in terms of gestational age, which ranged between 37-43 weeks, birth weight, method of delivery for both (caesarean section and vaginal delivery), number of pregnancies with a range extending from 0 to greater or equal to 3, and type of pregnancy, which included each of singleton and the twins.

All patients underwent special laboratory examinations and measurements that determined the levels of thyroid inflammation, its severity, and its impact on the patients, which included TSH (thyroid stimulating hormone), T3 (triiodothyronine), T4 (thyroxine), as well as TPO (thyroid peroxidase) antibodies, and Tg (thyroglobulin) antibodies.

Our study identified adverse outcomes related to postpartum complications for patients with thyroid hormone disorder. Also, the quality of life of patients with postpartum thyroid hormone disorder was evaluated, as the questionnaire scale for the quality of life of patients is between 0 - 100, where zero represents the poor quality of life for patients, and 100 represents the highest quality of life for patients.

Results

Table 1: Demographic characteristics of patients.

Characteristics	*Number of patients [N = 77]*	*Percentage [%]*
Age		
20 - 29	8	10.39%
30 – 34	12	15.58%
35 – 39	23	29.87%
40 – 45	34	44.16%
BMI, [Kg/m2]		
≤18.5	4	5.19%
18.6-24.9	50	64.94%
25-29.9	20	25.97%
≥30	3	3.90%
Comorbidities		
Hypertension	56	72.73%
High cholesterol	61	79.22%
Diabetes	12	15.58%
Kidney diseases	5	6.49%
Asthma	3	3.90%
Heart disease	2	2.60%
Smoking status		

Yes	14	18.18%
No	63	81.82%
Education level		
Primary	7	9.09%
Secondary	15	19.48%
College/university	55	71.43%
Employment status		
Working	43	55.84%
Not – working	34	44.16%
Income status, $		
< 800	37	48.05%
800 – 1200	23	29.87%
> 1200	17	22.08%

Table 2: Maternal characteristics.

Variables	**Number of patients [N = 77]**	**Percentage [%]**
Gestational age, weeks		
< 38	16	20.78%
38 - 41	43	55.84%
> 41	18	23.38%
Birth weight (Kg)		
< 1.5	32	41.56%
1.5 - 3.0	25	32.47%

≥ 3	20	25.97%
Mode of delivery		
Cesarean section	25	32.47%
Vaginal delivery	52	67.53%
Number of pregnancies		
0	35	45.45%
1	24	31.17%
2	14	18.18%
≥ 3	4	5.19%
Type of pregnancy		
Singleton	68	88.31%
Twin	9	11.69%

Table 3: Laboratory findings.

Variables	**Scores**
TSH (Thyroid-stimulating hormone)	4.02 ± 0.13, mU/L
T3 (Triiodothyronine)	172.02 ± 24.67, ng/dL
T4 (Thyroxine)	10.86 ± 3.56, mcg/dL
TPO (Thyroid peroxidase) antibodies	9.2 ± 0.8 IU/mL
Tg (Thyroglobulin) antibodies.	113.84 ± 6.92 IU/mL

Table 4: Determine adverse outcomes on women and infants with thyroid hormone disruption.

Parameters	Number of patients [N = 77]	Percentage [%]
Abortion		
Yes	3	3.90%
No	74	96.10%
Neonatal deaths		
Yes	4	5.19%
No	73	94.81%
PPH		
Yes	2	2.60%
No	75	97.40%
Preterm		
Yes	4	5.19%
No	73	94.81%
LSCS		
Yes	10	12.99%
No	67	87.01%
Low birth weight		
Yes	34	44.16%
No	43	55.84%
Menstrual problems		
Dysmenorrhea		
Yes	14	18.18%

No	63	81.82%
Amount of menstrual flow		
Scanty	10	12.99%
Normal	65	84.42%
Overflow	2	2.60%

Table 5: Assessment of quality of life-related to women in the postpartum period.

Items	**Scores**
Physical aspect	64.21 ± 8.56
Psychological aspect	68.27 ± 8.44
Emotional and social aspects	62.93 ± 6.55
Daily activity	69.41 ± 4.37

Discussion

Thyroid disorders are some of the most frequently hormonal disorders of women in pregnancy, which are associated to adverse mothers and fetal results. Thyroid dysfunction throughout pregnancy is often found in universal screening during the first early pregnancy selection. [19]

Thyroid hormone disturbance in pregnancy and postpartum has serious implications for mothers and fetal health. Thyroid disorder, either hyperthyroidism, may result in miscarriage, premature delivery, and baby respiratory distress syndrome. [20]

The new Korean Thyroid Association suggestions stress the significance of maintaining euthyroidism throughout pregnancy, and levothyroxine is recommended in subclinical hypothyroidism of TSH levels in excess of 4 mIU/L. [21]

In addition, assessing and controlling thyroid disorders during pregnancy, which include hyperthyroidism of Graves' disease as well as hypothyroidism following Hashimoto thyroiditis, is essential for mothers and fetal health. [22]

Postpartum thyroiditis it must be distinguished from different kinds for thyroid dysfunction because of different treatment techniques. Overall, careful treatment of thyroid hormone disturbance all over the pregnancy and after delivery is vital to optimal obstetric outcomes and mom health. [23]

The study conducted by Vaidhya B. et al. revealed a lower age than Western studies. This is due to our community had an elevated incidence in pregnancy and early marriage. Ajmani et al. observed that advanced maternal age is linked with an increased risk of thyroid disease. [24]

Potlukova et al. performed a cross-sectional study between pregnant women and discovered no significant connection among age along with serum TSH suppression or increase. However, in the general population, the prevalence of thyroid disorders has been found to increase with older age. [25]

An increase in hypothyroidism prevalence has been found in pregnancy, and it shows that every pregnant woman should get screened for thyroid problems in the beginning of their pregnancy to ascertain the condition. Maternal age and raised body mass index were significant with regard to thyroid dysfunction risks during pregnancy that led to varying levels for which these two factors seem to contribute differently thus affecting the overall percentage change ups and downs. [26]

Conclusion

Thyroid hormone changes throughout pregnancy can have significant effects both for the mother and the fetus in an increased risk for gestational diabetes as well as preeclampsia through adverse impacts in the brain development of the fetus; it is obvious that thyroid health is essential for optimal pregnancy. Postpartum issues, including postpartum thyroiditis, can occur as a result of these disruptions, emphasizing the significance for monitoring thyroid function throughout and following pregnancy, where early identification and care of thyroid hormone abnormalities may significantly decrease the risk of issues, although it is ensuring the health in mother and child.

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